Remarks

Prior to this amendment, claims 3-5, 9-12, 17-31, 34-36, 40-43 and 48-62 were pending in this case. The Office Action mailed Dec. 16, 2004 rejected all claims, asserting, in pertinent part, the following claim rejections:

(I.) Claims 3, 4, 9-11, 34, 35, 40-42, 57 and 58 were rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Kawakami et al. (5,613,261) in view of Bohman (4,918,441).

(II.) Claims 5, 12, 26-31, 36, 43, 50 and 59-62 were rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Kawakami '261 in view of Bohman '441 taken with Crotzer (5,910,700).

(III.) Claims 17-25 and 48-56 were rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Hoekstra et al (5,542,146) in view of Crotzer '700 or Japanese Patent 6-38912.

In response, this Amendment cancels claims 9-12, 17-25, 29-31, 40-43, 48-56 and 60-62, without prejudice to re-file the subject matter of those claims in a continuation case, such that the remaining pending claims in the present application are 3-5, 26-28, 34-36 and 57-59; and amends the remaining pending claims.

Each of the grounds of rejection set forth in the Action and the patentability of the claims as presented herein will next be discussed.

I. Rejection of Claims 3, 4, 9-11, 34, 35, 40-42, 57 and 58 as Being Allegedly Unpatentable Over Kawakami in View of Bohman

Amended, Independent Claims 3 and 34: In pertinent part, independent claim 3 has been amended to recite a debris sensor responsive to debris being collected by the apparatus for generating a debris signal indicating that the cleaning apparatus is collecting debris; wherein the processor is responsive to the debris signal to (1) select an operative mode of the cleaning apparatus and (2) steer the cleaning apparatus toward an area containing debris. Amended independent claim 34 is the method analogue of amended claim 3.

As the following discussion will show, neither Kawakami nor Bohman, taken separately or in combination, teaches or suggests the combinations of features recited in amended claims 3 and 34, and their dependents.

Kawakami: Kawakami '261 discloses a self-propelled, fluid-based cleaning device having a sensor 37 that allegedly allows it to "thoroughly clean only very dirty areas." The device includes a "mode sensing unit" 34 that "selects the operation travel and cleaning mode in accordance with the

results of sensor unit 37" (col. 3, ll. 18-20). Sensor unit 37 includes a "floor reflectivity sensor" 19 that is used to measure "the degree of dirt of the floor surface [ahead of the cleaning elements of the machine] prior to cleaning" (col. 3, ll. 3-9). In particular, the reflectivity sensor 19 includes LEDs 51 and photocells 52. Light from LEDs 51 is bounced off the floor ahead of the cleaning elements of the machine and detected by photocells 52; and a determination of "soil" is made by comparing the output from photocells 52 to "reflectivity data previously stored in memory (col. 3 – col. 4). When "it is determined that dirt is present on the floor", then "careful cleaning mode instructions are issued to driving controller 32" (col. 5, ll. 15-19). "Careful cleaning" mode differs from "normal cleaning" mode in the number of drops of cleaning fluid dispensed, the speed of rotation of cleaning sponges in the device, and the speed of forward movement of the device (col. 3, ll. 27-45).

In short, Kawakami describes the idea of calculating the dirtiness of an area ahead of the cleaning elements of the machine by bouncing light off it, and then comparing the amplitude of reflected light to previously stored reflectivity data. Based on the comparison, Kawakami can select "careful cleaning mode" – more cleaning fluid, faster cleaning sponge rotation, slower forward movement of the device.

The Action asserts that Kawakami discloses "a mode setting unit, a map, and memory 92 for determining the 'selecting a pattern of movement' as recited in the claims." The Action cites Kawakami FIGS. 3-8, col. 3, ll. 13-21, 47-57 and col. 4, ll. 16-17 for this assertion, and the following are the cited portions of Kawakami:

Col 3, ll. 13-21, 47-57: "FIG. 3 is a block diagram of the control block . . . mode setting unit 34 selects the operation travel and cleaning mode in accordance with the results of sensor unit 37, and issues instructions to driving controller 32 and cleaning controller 33. ... Thus, the cleaning mode is changeable for severely soiled areas and lightly soiled, such that the time required to clean the entire area can be reduced by allowing careful and precise cleaning for heavily soiled areas and rapidly advancing over areas only lightly soiled. When a cleaning region includes areas that do not require cleaning, or when it is judged that an area is not dirty . . . the cleaning operation of said area is interrupted and the cleaner only moves. . ."

Col. 4, ll. 16-17: "After the dirt condition of the floor surface as just determined is stored in memory 88, the careful cleaning mode instructions are issued to driving controller 32 and cleaning controller 33 in step #703."

Again, the Action asserts that these portions of Kawakami disclose "a mode setting unit, a map, and memory 92 for determining the 'selecting a pattern of movement' as recited in the

claims." However, Kawakami does not teach or suggest the combination of features recited in amended claims 3 and 34, including a debris sensor responsive to debris being collected by the apparatus for generating a debris signal indicating that the cleaning apparatus is collecting debris; wherein the processor is responsive to the debris signal to (1) select an operative mode of the cleaning apparatus and (2) steer the cleaning apparatus toward an area containing debris.

Bohman: The Action alleges that Bohman "discloses the debris/dust sensors for controlling the direction of the harvester guidance which is similar to Kawakami et al's debris/dust cleaner" and that "it would have been obvious . . to provide Kawakami . . . with the . . . sensors as taught or suggested by Bohman for controlling the direction of movement of the cleaner according to the map of pattern as stored in the memory 92 [in Kawakami]. The Action also alleges that Bohman "discloses a non-contact sensing unit . . . . comprising debris/dust sensors (34, 36) (col. 7, ll. 4-19) for detecting the energy beams 40 and 42 in the presence of dust and dirt . . . ."

However, Bohman, taken alone or with Kawakami, does not teach or suggest the combination of features recited in amended claims 3 and 34, including a debris sensor responsive to debris being collected by the apparatus for generating a debris signal indicating that the cleaning apparatus is collecting debris; wherein the processor is responsive to the debris signal to (1) select an operative mode of the cleaning apparatus and (2) steer the cleaning apparatus toward an area containing debris.

Bohman discloses a non-contact guidance system for a row crop harvesting machine, for use while the harvesting machine is advancing along or between rows of crops. In particular, Bohman discloses an electronic means for ensuring that the harvesting machine is not too far to the left or right when advancing down a row. It depends on the idea that stalks of corn or the like will interrupt an "energy beam" as the harvesting machine moves forward, and circuitry can be used to either generate a left/right steering correction or to alert a driver that he needs to manually steer to the left or the right.

In pertinent part (including the portion cited in the Action), Bohman states as follows:

Col. 2, ll. 2 et seq.: "The circuit of FIG. 2 may be utilized to develop steering correction signals in response to interruption of the energy beams 40 and 42. A signal source 48 applies an energizing signal to transmitters 24 and 26 to generate the energy beams 40 and 42."

"The steering correction signals 56, 57 produced by time comparator 54 are applied to an averager circuit 58 which averages the signals over a number of stalks to obtain a statistical measure

of the correction signals. The averager circuit 58 then produces a "left" or "right" steering control signal on lead 60 or 62."

"The steering control signal leads 60 and 62 may be connected to the conventional steering control mechanism for the harvesting machine to automatically control steering or they may be connected to visual indicators to indicate to the operator that he should manually steer to the left or to the right."

Col. 7, ll. 3 et seq.: "The energy beams 40 and 42 may be of practically any type such as, for example, sonic, ultrasonic, visible light, or infrared. The principal advantage of using acoustic beams is their ability to function in the presence of dust and dirt in the region of the sensors and receptors. However, sonic beams have certain disadvantages in that the sound energy may penetrate the standing crop to some extent, and may bend around the crop stalks thus making discrimination of the receptor signal difficult. "

Thus, Bohman discloses a photocell (or sound or ultrasound) sensing system that processes signal variations caused by crop stalk beam interruptions. However, Bohman does not disclose a debris sensor - - it discloses a photoelectric or ultrasonic crop sensor that is claimed to operate even despite the presence of dust. Bohman is explicitly designed to ignore dust and dirt, while the claims describe a method/apparatus that seeks to detect dust and dirt. Bohman discusses ways of overcoming the problem of dirt and dust obscuring his signals and/or detector, but not using a debris strike signal or a debris signal of any kind.

Bohman's sensors are configured to detect crop stalks and are claimed to operate despite the presence of dust and dirt. Therefore, they seek to ignore, not sense or measure, dirt and dust. In contrast to the present invention, therefore, Bohman is directed to a completely different problem to be solved (how to detect crop stalks even in dusty environments), and Bohman contains no teaching or suggestion of how they could even be adapted to the claimed to the present invention.

The amended claims distinguish patentably over Kawakami, Bohman and the other art of record, taken alone or in combination.

II. Rejection of Claims 5, 12, 26-31, 36, 43, 50 and 59-62 As Being Allegedly Unpatentable Over Kawakami In View of Bohman Taken With Crotzer

Point 5 of the Action states: "Claim 5, 12, 26-31, 36, 43, 50 and 59-62 further recite that the debris sensor comprises a piezoelectric sensor located proximate to a cleaning pathway of the cleaning apparatus and responsive to a debris strike to generate a signal indicative of such strike.

However, the patent to Crotzer discloses dust sensor apparatus fabricated from a polymer material . . . or piezoelectric crystalline material . . . (see column 3 lines 15-16). Since Crotzer discloses at the background of the invention that mechanical, electrical and optical sensors are used as dust sensors. Crotzer further discloses at the background of the invention that piezoelectric sensor can be used in place of the mechanical . . . Therefore, it would have been obvious to provide Kawakami et al. with the piezoelectric dust/debris sensor as taught or suggested by Crotzer for the benefit of the piezoelectric sensor as disclosed at the background of the invention [of Crotzer]."

In response, Applicants first note that claims 12, 29-31, 43, 50 and 60-62 are among those cancelled. Accordingly, we focus here on claims 5, 26-28, 36, and 59.

In addition, as noted above, Kawakami and Bohman, taken separately or in combination, fail to teach or suggest the claimed combinations of features recited in the amended independent claims 3 and 34, from which the other claims depend.

The combination of Kawakami, Bohman and Crotzer still does not teach or suggest the combination of features required by amended claims 3 and 34. Crotzer discloses a dust sensing apparatus using a PVDF transducer element oscillating at a resonant frequency to detect changes in dust concentration. There is no disclosure or teaching of sensitivity to debris strikes as required by claims 5, 26 and 36. Instead, the teaching is of a transducer that is sensitive to the "quantity of dust on the sensor" (col. 2, ll. 38-45). Sensitivity to changes in damping due to "the quantity of dust on the sensor" is not the same as, or equivalent to, sensitivity to dust strikes. Accordingly, the claims distinguish patentably over the combination of Kawakami, Bohman and Crotzer.

III. Rejection of Claims 17-25 and 48-56 As Being Allegedly Unpatentable Over Hoekstra '146 In View of Crotzer or Japanese '912

Claims 17-25 and 48-56 have been cancelled by the present amendment, thus mooting the alleged point of rejection. It is noted that the cited references, taken separately or in combination, do not teach or suggest the combinations of features recited in the amended claims.

IV. Conclusions:

The other art of made of record and not relied upon, including the patents to Coker, Dickson et al., Gorsek, Kobayashi et al., Nakanishi et al., and Taylor et al., is not considered to detract from the patentability of the claims as presented in this Amendment.

The present response is deemed to attend to each point raised in the outstanding Action. The present response amends the claims to more particularly claim features of the present invention. No new matter has been added, and support for the new claims is found in the specification and drawings as filed. The Examiner is respectfully requested to allow the claims and pass the application through to issuance. Should questions arise, the Examiner is respectfully invited to contact the undersigned.

Respectfully submitted,

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